

Subsolidus solution and oxide ionic conductivity of Nd-substituted bismuth yttria fluorites

ABSTRACT

Pure phase $\text{Bi}_{1.6}\text{Y}_{0.4-x}\text{Nd}_x\text{O}_3$ solid solution with $x = 0.00, 0.10$ and 0.20 was successfully synthesised via conventional solid state method at 850°C in 21 h. The materials were refined and fully indexed with space group Fm-3m and lattice parameters, a ranging from $5.5124(1)$ Å to $5.5289(4)$ Å. Variation of the lattice parameters of these materials were found in an almost linear correlation with increasing Nd_2O_3 dopant concentration. Thermal analysis of $\text{Bi}_{1.6}\text{Y}_{0.4-x}\text{Nd}_x\text{O}_3$ solid solution showed no thermal event that associated with any phase transition or weight loss within the studied temperature range of 35 to 900°C . The electrical properties of the samples were investigated by ac impedance analyser, HP4192 at temperature ranging from 25 to 800°C over frequency of 5 Hz to 13 MHz. $\text{Bi}_{1.6}\text{Y}_{0.3}\text{Nd}_{0.1}\text{O}_3$ exhibited the highest oxide ion conductivity among the synthesised samples in $\text{Bi}_{1.6}\text{Y}_{0.4-x}\text{Nd}_x\text{O}_3$ solid solution.

Keyword: Fluorite; Oxide ion conductivity; Solid Solution; X-ray diffraction